

ಉಪಗ್ರಹ उपग्रह Upagrah News Letter

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ವಿಮಾನಪುರ, ಬೆಂಗಳೂರು - 17

इसरो उपग्रह केन्द्र
विमानपुर, बेंगलूरु - 17

ISRO SATELLITE CENTRE
VIMANAPURA, BENGALURU - 17

Director's New Year Message



In his message, Director expressed his happiness that, with the roll-out of CARTOSAT-2S4, MICROSAT & INS-1C ISAC has marked maiden century of rolling out satellites. During his address he sets the new target of satellites for future including GSAT, GISAT, LEO and Interplanetary mission.

He highlighted that in 2017 a new platform SPARK for recognizing R&D effort was established. Also, to enhance and streamline research and developmental activities a group Advanced Technology Development was formed. He further told that a few new techniques like solar panel inspection etc. was established for improvisation of hardware.

Director wished all ISACian's and their family members a **VERY HAPPY & PROSPEROUS - 2018**



Prof. U. R. Rao
(1932-2017)



ISAC Community rises as one in veneration and reverence to its Architect as a tribute to his indomitable spirit and visionary leadership.
ISAC will remain witness to his works and times for eternity.



GSAT-15 COMPLETES 2 YEARS IN ORBIT

GSAT-15, a communication satellite having 24 Ku-band transponders and GAGAN payload was launched on 11th November 2015 aboard ARIANE 5 launch vehicle. GSAT-15 has been providing Communication services to the nation from its orbital slot of 93.5° E longitude. The communication payload is being effectively utilized for the intended DTH services.

GSAT-16 COMPLETES 3 YEARS IN ORBIT

GSAT-16, a communication satellite having 12 Ku-band & 36 C-band transponders was launched on 07th December 2014 aboard ARIANE 5 launch vehicle. GSAT-16 has been providing Communication services to the nation from its orbital slot of 55° E longitude.

GSAT-18 TURNS ONE YEAR OLD IN ORBIT

On the sixth day of October 2016, GSAT-18 carrying 12 Ku band, 24-Normal C band and 12 Upper Ext-C band transponders, joined the Geo constellation of ISRO. The spacecraft has completed one year of successful in orbit operations, by providing intended services flawlessly.

MEGHA-TROPIQUES SUCCESSFULLY COMPLETES SIX YEARS IN ORBIT

Megha-Tropiques, a joint venture between ISRO and CNES, aiding for study of water cycle and energy exchanges in tropical region for weather prediction and climate research, was launched on 12th October 2011 from SDSC, Shriharikota. Megha-Tropiques has successfully completed six years of on-orbit observations with four Science instruments on board namely MADRAS, SAPHIR, ScaRaB and ROSA.

RESOURCESAT-2A COMPLETES ONE YEAR IN ORBIT

Resourcesat-2A Satellite launched on December 07, 2016 by PSLV-C36 from SDSC, SHAR, and has successfully completed One year of In-Orbit operations. It carries 4 payloads viz., Linear Imaging Scanning Sensor(LISS)-3, Linear Imaging Scanning Sensor(LISS)-4, Advanced Wide field Sensor(AWiFS)-A & B and Solid State C-Band Transponder(SCBT) onboard. All the payloads are functioning satisfactorily.

INSAT 4A COMPLETES 12 YEARS IN ORBIT

INSAT 4A, the heaviest and most powerful communication satellite of its time having 12 ku-band & 12 C-band transponders, was launched on 22nd December 2005. Since then, INSAT-4A has been providing communication services (DTH in particular) to the nation from its orbital slot of 83° E longitude.

EDITORIAL

The year 2017 was an eventful year with a number of significant accomplishments like the successful launch of 104 satellites in a single mission by PSLV-C37, the launch of IRNSS-1G by PSLV-C33 providing

"NavIC" for India, giving its own Satellite Positioning System etc. along with various recognitions with awards like "Engineering Excellence Award 2016" to our Director, ISAC and the award for "Best maintained ISRO Center" for the year 2017 to ISAC. While the year 2017 began with a pleasant news of Prof. U.R. Rao, the former ISRO chairman and the Founder Director of ISRO Satellite Centre, honoured with the highest Padma award "Padma Vibhushan", the same year also brought us the sad news of his demise.

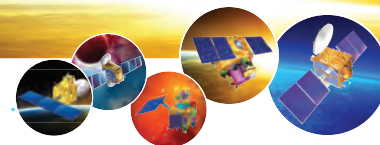
Let us begin this New Year 2018, with warm wishes to all ISACians along with hearty Congratulations to all the ISRO awardees, from Team Upagrah and its readers.

This edition gives a glimpse of all the satellites that have completed successful number of years of operation on-board in the last quarter of 2017. An article on "Facilities at ISITE" gives an overview of various facilities at ISITE, highlighting the capability of rolling out satellites, starting from the first stage of having subsystems to Assembly, Integration and Testing (AIT) of the complete satellite from one campus making it unique in the world.

An article on "Frangi actuator" discusses the details of the actuator, the mechanisms involved in it and its application in ISRO. This edition also has an article on the "Supply Chain Management for Spacecraft" highlighting the success of R&D in ISRO's programmes. In addition, there is a brief note on the aspects of the "Failure Analysis Lab" at ISAC and the significant contribution of this lab related to various activities at ISAC.

Upagrah along with its readers congratulates all the award winners for their excellent contributions. Team Upagrah looks forward to your valuable comments and views.

Dr. Anil Agarwal, Chairman, Upagrah Editorial Board



FACILITIES AT ISITE – AN OVERVIEW



Inauguration of AIT-2 Facility by Shri. A. S. Kiran Kumar, Chairman, ISRO

The ISRO Satellite Integration & Test Establishment (ISITE) an extension of ISAC was conceived in the year 2000 as a facility to augment the satellite building capacity of ISAC. This facility is about 7 kilometers away from ISAC, Bangalore which is replete with all facilities for rolling out a satellite right from the elemental / subsystems stage to Assembly, Integration and Testing (AIT) of satellites – all in one campus making it unique and only one of its kind in the world. As of now, all of ISRO's high power communication satellites, navigation and meteorological satellites are built and tested here.

ISITE campus in the sprawling 110 acres land at Marathahalli, Bengaluru, today boasts of more than fifteen technical facilities such as Compact Antenna Test Facility (CATF), Assembly integration and test facilities, Space Astronomy Laboratories, RF Shielded Anechoic Chamber, 6.5 m Thermo vacuum chamber, Vibration test facility, Acoustic test facility

and Avionics production facility - providing platform for avionics fabrication and testing by industry partners. The Avionics production facility at ISITE houses extensive fabrication & testing labs for vendors, apart from 4 Thermo vacuum Facilities, four numbers of Climatic chambers and a 3.5 ton vibration shaker for environmental testing of all the packages and subsystems realized. The Compact Antenna Test Facility at ISITE is primarily used for Spacecraft level Antenna and communication payload characterization. The Anechoic Chamber is used to carry out Spacecraft level EMI/EMC and RF characterization tests

ISITE has two clean rooms, one in AIT-1 Complex and the other in AIT-2 Complex, in the space park. The AIT-2 Facility was inaugurated by Shri. A.S.Kiran Kumar, Chairman, ISRO in the presence of Dr. M. Annadurai, Director, ISAC on October 27, 2017. Both the clean rooms are well-connected with road ways for easy and safe transportation of spacecraft and its hardware. These clean rooms are of 1 lakh class with nearly 1850 square meter working area. These clean rooms are well-connected with other test facilities for testing of spacecraft during various phases of realization. These clean rooms are provided with change room, air shower, ESD flooring, lighting, overhead EOT cranes, compressed air supply, GN2 supply, dedicated seismic platform for CG & MI measurements, zero G fixture, mass parameter measuring machines etc. The clean rooms support AIT of spacecraft up to 6 ton class.

ISITE also has Environmental test facilities such as a large 6.5m dia thermo vacuum chamber for conducting satellite level thermal vacuum performance tests, and a 29 ton shaker that can be used for conducting vibration tests and Acoustic test facility with Reverberation Chamber, which is about 1450 m cube to conduct acoustic tests on spacecraft.

"Space Park" spread across of 25 acres area within ISITE houses all the facilities for satellite building and testing by the Industry partners in order to enhance the capacity of satellite building. The space park presently houses AIT-2 facility, High density interconnect (HDI) facility, Solar panel and battery labs along with required services. The High Density Interconnect Facility is aimed at realizing space grade PCBs with fine line and fine spacing.

Further, 6 more new facilities are under various stages of construction and five new facilities are under planning. An exclusive building to house the mechanical system activities, a facility for space qualified Solar Panel and Battery fabrication & testing and a Flight hardware Storage facility will be ready shortly. Heat Pipe development Facility which will augment heat pipe throughput is due to be operational. Addition of one more Dynamic Test Facility, New Compact Antenna Test Facility to cater to I-6K spacecraft requirements, Subsystem Level EMI/EMC Test Facility and Extension to the present clean room of AIT-1 are also on the anvil.

These facilities when fully ready will be able to deliver hardware in tune with all satellites requirements to create a strong supply chain management. Further, with all the clean rooms at ISAC and ISITE, ISAC will be able to integrate more than 20 satellites at a time. In ISAC's quest to forge ahead with its industrial partners, all these facilities are available to the industry for spacecraft building and testing.



Bird's eye view of ISITE Facilities

ISRO has envisaged the load of building 15-18 satellites per year with active involvement of Indian Industries. Apart from building space infrastructure, ISAC has also systematically encouraged industries to go hand in hand in building satellites - thereby ensuring a conducive eco-system for industries to build satellites in India.

ISAC is planning to involve industry partners in a big way and the industry can play a vital role to build more and more satellites. This collaborative approach will lead to win win situation for ISRO and its industry partners to climb newer heights and to be a part of fulfilling the emerging demands of both national and global needs.

Shri. Prasad GNV, DD, MISA, ISAC & Dr. V.K.Hariharan, DD, ICA, ISAC



FRANGI ACTUATOR BASED HOLD DOWN RELEASE MECHANISM FOR SPACECRAFT APPENDAGES AND PAYLOADS

The Frangibolt actuated mechanism was developed by TiNi aerospace USA. It was developed under Advanced Release Technologies (ART) program of Naval Research Lab USA as an alternative to pyro based release devices. The development was further supported by NASA. The first on orbit operation of the Frangi actuator dates back to 1994 when it was used to deploy solar array of Clementine spacecraft. A typical Frangibolt actuated Hold Down Release Mechanisms (HDRM) is shown in Fig.1. The mechanism involves an intentionally notched bolt holding both fixed and deployable members of the spacecraft with a preload and passing through a Shape Memory Alloy (SMA) cylinder known as Frangi actuator. The temperature of the SMA cylinder is brought to phase transformation temperature by powering on the heater attached. The phase transformation of SMA causes the expansion of the cylinder, which is very high compared to the normal thermal expansion of metal. The expansion of the actuator increases the stress in the bolted joint. Notched bolt being the weak link in the joint succumbs to the stress which is beyond its yield point. The failure of the bolt causes freeing of the deployable member from the stationary structure, thus initiating deployment of the appendage. The main advantage of this system is the actuator is resettable up to 60 times, thus requiring replacement of the cut bolt for the next event on ground. This simple system has less component count without any movable element compared to the traditional release mechanisms, thus improving the reliability of the release device.

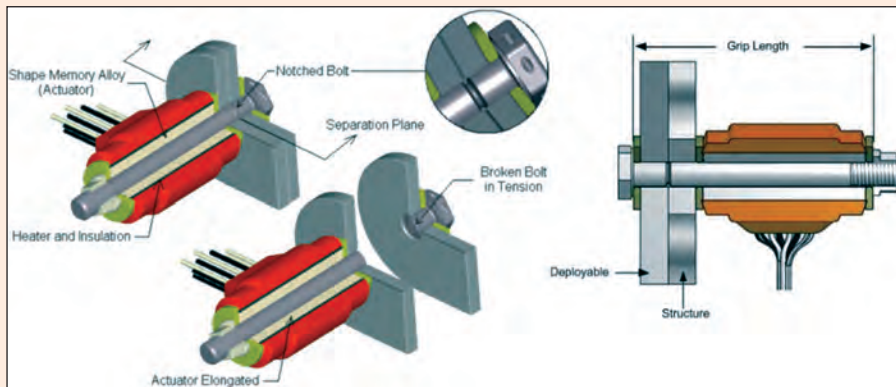


Fig 1. Concept of Frangibolt actuated HDRM

The main components of the Frangibolt actuated HDRM are; 1) Actuator 2) Notched bolt 3) Heater and sensors and 4) Preloaded joint.

Actuator

SMA refers to a group of materials which have the ability to return to a predetermined shape when heated. The shape memory effect is caused by a temperature dependent crystal structure (Fig.2).

When an SMA is below its phase transformation temperature, it possesses a low yield strength crystallography referred to as Martensite. While in this state, the material can be deformed into other shapes with relatively little force. The new shape is retained provided the material is kept below its transformation temperature. When heated above this temperature, the material reverts to its parent structure known as Austenite causing it to return to its original shape. This phenomenon is harnessed to provide a unique and powerful actuator.

The most widely used shape memory material is an alloy of Nickel and Titanium called Nitinol. This particular alloy has excellent electrical and mechanical properties, long fatigue life, and high corrosion resistance. As an actuator, it is capable of generating up to 5% strain and 345 MPa recovery stress, resulting in ~1 Joule/gm of work output. Nitinol is readily available in the form of wire, rod, and bar stock with transformation temperature in the range of -100° to +100° Celsius.

Notched bolt

The notched bolt has the dual contradictory purpose of holding the appendage allowing sufficient preload to be given for non separation of the joint during dynamic loading condition and having just sufficient cross section area at the notch to yield when the actuator expands. The bolts are made up of Titanium alloy with minimum strength of 1100 MPa, on which the notch is cut to a dimension of statistical precision level to cause definite breaking when commanded.

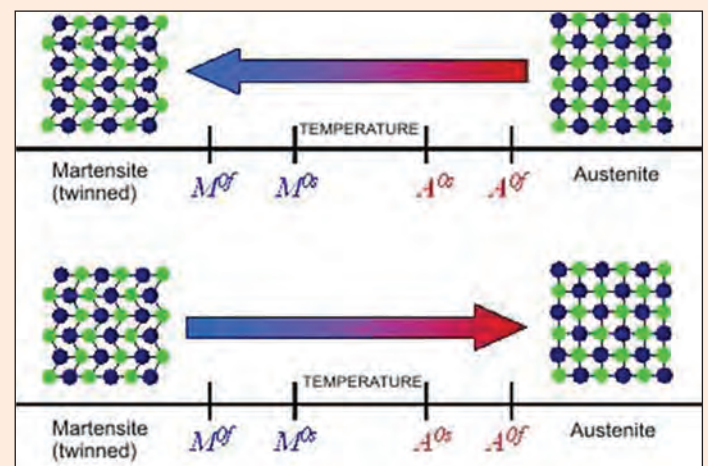
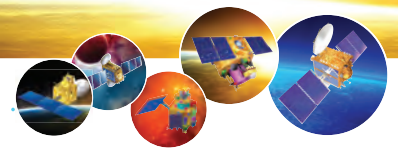


Fig 2. Temperature dependent crystal structure of SMA



Heater and sensors

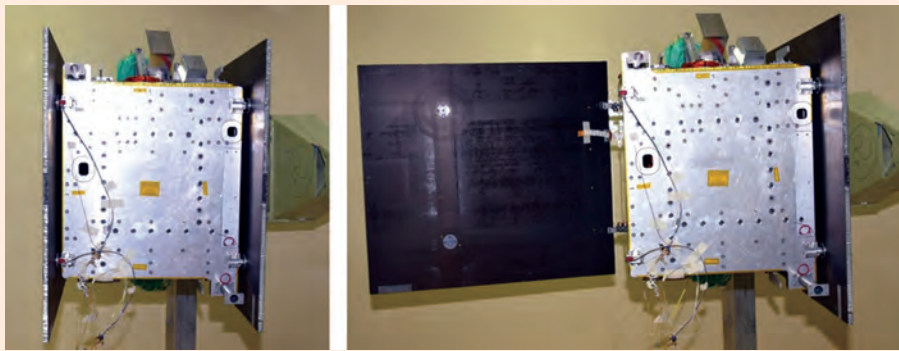
The crux of the actuator is heater element which needs to provide heat to an expanding member. This puts lot of emphasis on the bonding method and the heater element design to sustain the expansion of the cylinder. Each actuator is provided with primary and secondary heater incorporating electrical cold redundancy. The actuation could be sensed by measuring the raise in the actuator temperature using Resistive Thermal Detector (RTD) temperature sensors provided with redundancy, which are very similar to PRTs.

Preloaded joint

The actuator and bolt system design puts restrictions on the type of preloaded member and their sizes. The overall preloaded joint grip length is limited for each type of actuator in order for the sufficient failure strain to be developed in the bolt for the given expansion of the actuator. This again implies that the compliance of the preloaded members to be minimal to preserve the whole expansion towards failure strain for the bolt. The thermal conductivity path from the actuator to the preloaded members needs to be minimised using a set of two optimised thickness titanium washers on both ends of the actuator.

Usage of Frangi actuators in ISRO

The Frangi actuator based HDRM is being planned to be used in MICROSAT mission for the first time. There are two solar panels which are held to the spacecraft during launch by two actuators each for one panel. The stowed and deployed configuration of the MICROSAT qualification model is shown in Fig.3.



(a) Stowed Configuration

(b) Roll panel after deployment

Fig 3. Predynamic deployment test in C&M model

It is further being planned to be used in Chandrayaan-2 Rover and Lander mechanisms and HDRM for the door mechanisms in Aditya-L1 mission.

Advantages and limitations

The incorporation of mass efficient Frangi actuator based HDRM do not call for very massive electronic package used for Pyro devices. The HDRM has high reliability due to less number of moving elements

and refurbishment of only the bolt. The overall HDRM has very less footprint requirement compared to traditional mechanisms. The HDRM being low shock release device, it can be used near shock sensitive elements on the spacecraft.

Every advantage comes with a rider, even this actuator has few limitations falling short of it being a panacea. The grip length requirement for the preloaded joint has the limitation on the number of folded appendage usage such as in Solar array HDRM. Since the actuator being a thermally operated element, the response time is high and variable. This puts limitation on usage where quick release of appendage is required. The limit on strain needed for bolt cutting calls for a very careful assembly and strict quality checks for the gaps and grip length in the preloaded joint.

SHAMRAO, A SHANKARA

Spacecraft Mechanisms Group, ISAC

AWARDS TO DIRECTOR, ISAC

**Bhaskara
Award from
Indian Remote
Sensing
Society**



Dr. M. Annadurai
Director, ISAC

**Achievement
Award in the field
of Science from
Union Bank of India**



SUPPLY CHAIN MANAGEMENT FOR SPACECRAFT / SUB-SYSTEM REALIZATION

Introduction

The success of R & D in ISRO Satellite Programme is an internationally recognized achievement as it has delivered 24 x 7 x 365 operational space services to the Nation. The successive World-Space-Biz/ SPACE EXPOs held by ANTRIX-CII and the recent FICCI-Space Industry conference highlight the trend and the transition from a traditional R&D organization to an integrated approach of R&D with Manufacturing and Services. Thousands of critical national services (directly) and lakhs of jobs (indirectly) depend on these space services being provided by ISRO's Space Programme/ Satellites. Apart from the Technical and R&D aspects, infrastructure, HR and Supply Chain Management factors play a significant role to accomplish the goal of throughput of 12 to 18 S/C per annum.

SCM needed to meet the Growing Demand in Spacecraft Production and Services

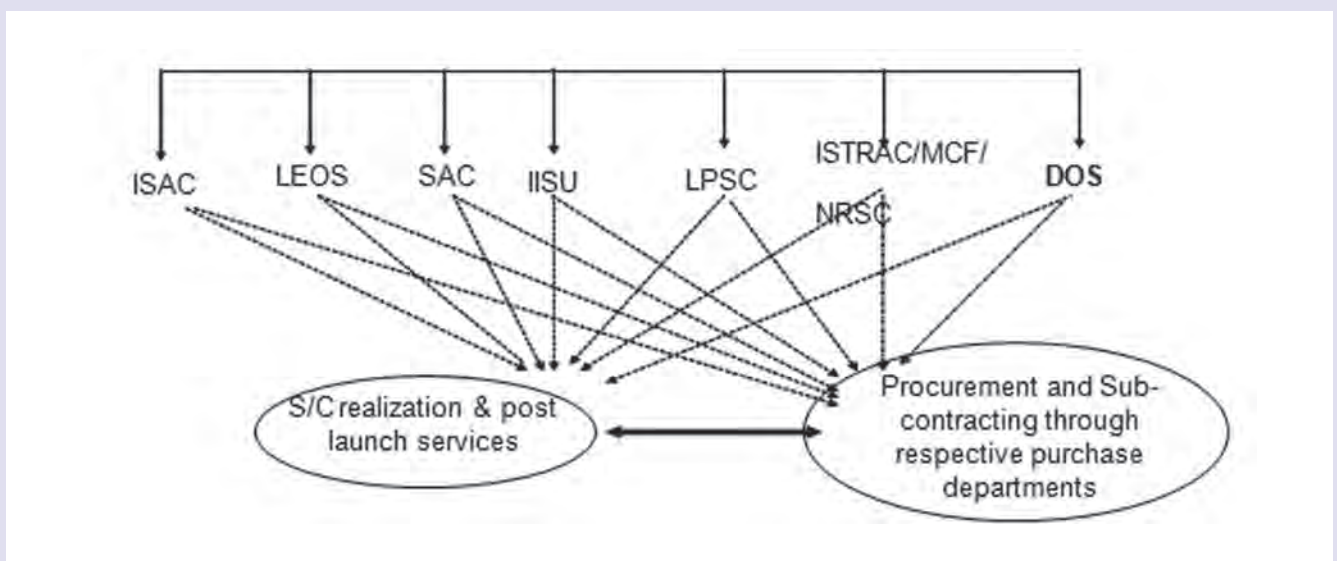
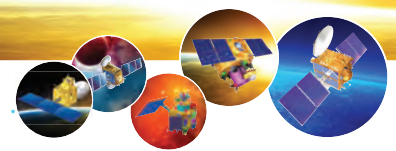


Fig 1. Block diagram of ISRO Satellite Programme spread across multiple Centres and linkage with Purchase / Procurement departments

In the past, spacecrafts were made in 5 to 6 years time frame in an R&D environment with a throughput of 2 to 3 Spacecrafts per annum with very less Volume at a Low Speed of Work Execution. Today, when the need is to realize Spacecrafts in a CYCLE TIME of less than 2 years with a Throughput of 12 to 18 spacecrafts per annum aiming at High Volumes of spacecraft production at a relatively Higher Speed of Work Execution to meet the user demands; the increasing load on Project Teams, Procurement /Purchase, Admin, Accounts, Stores etc., can only be imagined. This highlights the Importance of Supply-Chain-Management (SCM) Framework for Spacecrafts & their Sub-System Realization/Production with Vendor Support and reducing Cycle Times. The purchase/procurement/accounts/admin/stores activities and workflows across different centres play a significant role in the overall schedules. SCM is defined as "the end to end management of a network of all business processes and activities involving procurement of raw materials, manufacturing and distribution management of Finished Goods/Services. SCM not only addresses the available and required resources of businesses but also provides right ways and means to plan and acquire them in a timely manner by providing right information at right time. Some of the initiatives like a Centralized Budgetary Information Management System (CBIMS) through Sandesh, COWAA/EGPS for e-Procurement etc., are helping in this direction.

Significance of Purchase, Vendors and Sub-contractors in an R&D/Manufacturing Service Era

Though the R&D designs are made in-house, vendors play a significant role in supporting the realization of Subsystems and S/Cs as illustrated by the following table.



Consider realization of a Sub-System and its delivery to S/C with Vendor support which is linked to Purchase / Procurement and is illustrated below.

	Sub-system	Vendor's role	Purchase's role
1	Components		
	Passive Components Active Component Mechanical components like connectors etc., RF components Digital ICs / Memories / Processors / FPGAs & ASICs 1553 Controllers etc.,	* Components are procured from Different Vendors and they are mounted in the package. * Vendors for components play a significant role in the design of the sub-systems as obsolescence has become quite normal due to rapid changes in technology. A single component change in Memories / FPGAs / Processor / 1553 can affect schedule critically. * Any upgradation in component calls for a FRESH LAYOUT and the life-cycle for card / package realization needs to be redone * Screening of components is also done with vendor support	Procurement of components is a major activity and involves a large number of vendors in view of the variety of components used. Many of the FLIGHT components are HIGH COST items and have to go through long procurement processes with approvals at HQ.
	HMCs	• Procurement of semiconductor dies • Procurement of mechanical packaging for HMCs • Realization of HMC Test jigs with vendor support • Realization of HMCs with vendor support	Procurement / Purchase / Vendors play an important role in realization of HMCs.
2	Mechanical		
	Mechanical housings	Mechanical Drawings are also done with support of Contract staff supplied by Vendor under our supervision Housings are done with the help of Vendor Procurement of raw material for mechanical housings	Multiple vendors for MECHANICAL activities and corresponding Purchase procedure
3	Electronics (Card Level / Package level)		
	e- CAD	PCB layouts are done with the help of Vendor with our approval	* Multiple vendors for ELECTRONICS related activities for FAB & QC as well as for Test & Evaluation * Material management for FAB & QC involves extensive procurement from a variety of Vendors
	PCB realization	PCB realization is done with the help of Vendor Facility / internal facility to meet increasing load	
	Fabrication & QC of cards / packages	Wiring of cards is also supported by Vendor's staff Extensive Material Management for FAB & QC involves large variety / quantity / quality requirements. ISO audit / ESD audit with external certified agencies - Vendors	
	Testing of Cards / Packages	* Testing is done with the help of multiple Vendors for different type of Electronic packages – Digital / RF / Power etc.,	
	Test Systems	Realization of Custom Test equipment / stimuli equipment for Testing of flight cards / packages based on specifications given by R & D Teams with Vendor support	Significant Purchase procedure in view of both technical / commercial aspects
4	Environmental Facilities for Testing before delivery to AIT		
	LN2 for Environmental Qualification	* Supply of LN2 requires Indian Oxygen Limited (i.e., vendor) * contract staff to support the facilities is also from a vendor	Special Vendors to supply LN2 and consequent Purchase procedures for MOUs etc.,

SUPPLY CHAIN/ HR framework of ISRO Satellite Programme

Increasing number of Projects with reducing cycle times is a major motivation factor for SCM strategy at ISAC. Also, Information Technology is an important driver in SCM and Digital technology can transform production processes and business processes. Also, Information Technology is an important driver in SCM and Digital technology can transform production processes and business processes by making available “right information to the right people at right time” and also transparency. The biggest savings will come from the reduction in TRANSACTION costs as well as time. These benefits have given prominence to Supply-Chain-Management (SCM) in all areas of manufacturing in Aerospace Programmes



across the globe. A beginning has been made with EGPS/e-procurement but needs to be taken forward addressing the issues faced.

A look at the trend of the annual budget (Fig 3) and accordingly number of purchase files (Fig 4) reveal an increasing trend over the years with the increase in the number of approved projects.

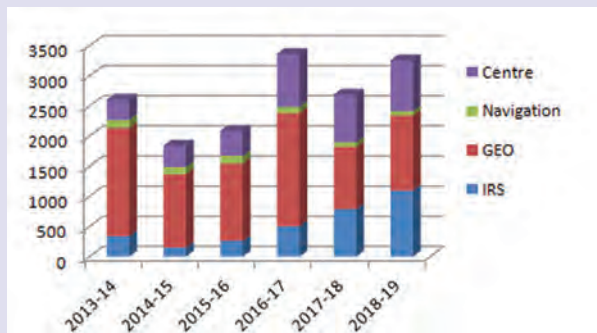


Fig. 3 ISAC Budget Trend (Amounts in Rs. Cr.)

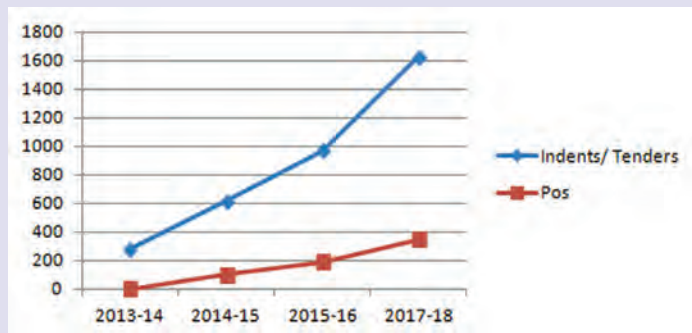


Fig. 4 Trend of EGPS Indents and Purchase Orders (No. of files excluding COWAA files)

SCM strategy will result in TOTAL CONNECTIVITY and VISIBILITY in the purchase / procurement frameworks of intra-centre and inter-centre across ISAC / LEOS /LPSC / VSSC / SAC / IISU / MCF/ ISTRAC / HQ to achieve better synchronization/ coordination. This optimization along with vendor support will help in faster realization of Spacecraft/Subsystems to meet the goal of 12 to 18 S/C per annum to meet the customer requirements with reduced cycle times.

Integrated SCM System with DATABASEs for Procurement/Purchase

There is a need for a centralized databases for various items like components, sub-systems, materials etc., with the required information like specifications, status of technology, availability in market, prevailing cost, sources of supply, stock status etc., which can be used for many purposes like estimating the cost of the item before indent, indenting, for comparison of prices of the quotes with reference to previous procurement, to know the sources of supply etc. By having these centralized databases, it will help the Indentor, Purchase staff, Accounts and other Technical Divisions to speed up the procurement activities. To a great extent the right source can be contacted for supply of items within the planned time frame.

Presently, attempts are being initiated at Purchase to develop and augment multiple databases of Vendor Master, Item Master and Budget Master etc. Such comprehensive centralized database can be used by Indentors and will also give several advantages. Also, the power of digital technology needs to be explored with a paperless end to end workflow. Towards this, ISAC has initiated the process for introduction of an integrated SCM System to carry out paperless indent to inventory activities, as part of the overall Enterprise Resource Planning (ERP) infrastructure. The system once implemented, is expected to make it more Indentor and Vendor Friendly and reduce CYCLE TIMES for Procurement further. Hence, the TIME-LINE process of indent to P.O. and subsequent trace of payment is now part of sub-system / spacecraft realization in view of the reducing CYCLE TIMES. Cash flow is a direct reflection of work-execution as payment is done in instalments w.r.t various milestones of work-execution with vendor support. Subsequently, the entire supply-chain of procurement process needs to be UNIFIED across ISRO via a WEB-based e-Procurement portals etc. that can be accessed through SPACENET so that all the stakeholders right from the suppliers to all project teams to the end users will be benefitted.

Conclusion: Realising the importance and urgent need for adopting industrial approach for achieving the targets, ISRO has recently formed an Apex Committee for implementing an ERP solution with a combination of in-house applications and packages as well as some bought out items as may be necessary. This effort is primarily focused on the inventory-to-integration monitoring and management; and took up PSLV as a pilot project. The proposed SCM System at ISAC covers an important segment of Supply Chain Management portion of the ERP from Indent to Inventory which is common to all goods and services and can be adopted suitably across the board. Such an integrated SCM system will save TIME across ISRO and will help in faster delivery of components/packages/sub-systems to all on-going Projects, concurrently and also for future R&D activities.

Shri Anoop Srivastava*, Dr. Murthy Remilla, Dr. JK Kishore*****

*Controller/CEO EPM Programme Office; ** Head, Supply Chain Management Division/ EPM P.O;

***Associate Project Director, SPADEX

EVENTS



WORKSHOP ON DESIGN OF SURFACE -
ACOUSTIC -WAVE (SAW) FILTER

VISIT OF CAG
AUDIT TEAM

SWACHH BHARATH ABHIYAN PROGRAMME

Import - Export
(Post GST Perspective)

Mihir A. Shah
WORKSHOP ON
BASICS OF GST

DIRECTOR CONGRATULATING ISACIANS PARTICIPATED IN INTER CENTRE
SPORTS MEET HELD AT SAC, AHMEDABAD.

INAUGURATION OF KANNADA
TECHNICAL SEMINAR

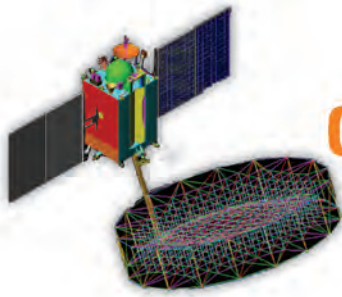
GSAT-11 BRIEFINGS TO SENIOR OFFICERS

GST WORKSHOP

INAUGURATION OF AITF-2 AT ISITE

RELEASE OF ISAC CLOUD BY DIRECTOR ISAC

C & MG WEBSITE INAUGURATION
BY DIRECTOR, ISAC



GSAT-6A



JANUARY

S	M	T	W
	1	2	3
7	8	9	10
14	15	16	17
21	22	23	24
28	29	30	31

15 - Makar
26 - Repu

FEBRUARY

S	M	T	W	T	F	S
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11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28			

MARCH

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11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

29 - Mahavir Jayanti
30 - Good Friday

GSAT-29



JUNE

S	M	T	W	T	F	S
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3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

16 - Id-ul-Fitr

GSAT-7A



AUGUST

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
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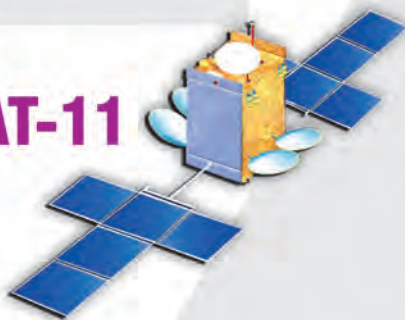
15 - Independence Day
22 - Id-ul-Zuha (Bakrid)

SEPTEMBER

S	M	T	W	T	F	S
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2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

13 - Ganesh Chaturthi
21 - Muhurram

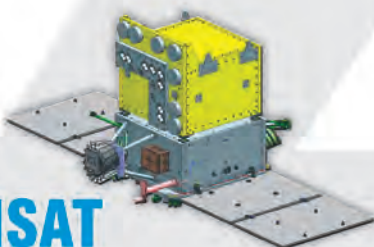
GSAT-11



CHANDRAYAAN-2



EMISAT



DECEMBER

S	M	T	W
30	31		
2	3	4	5
9	10	11	12
16	17	18	19
23	24	25	26

25 - Ch

JARY

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10	11	12	13	
17	18	19	20	
24	25	26	27	

Sankranti
Public Day

APRIL

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8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

30 - Buddha Purnima

MAY

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27	28	29	30	31		

JULY

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22	23	24	25	26	27	28
29	30	31				

OCTOBER

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21	22	23	24	25	26	27
28	29	30	31			

02 - Mahatma Gandhi's Birthday
18 - Dussehra (Mahanavami)
19 - Dussehra

NOVEMBER

S	M	T	W	T	F	S
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08 - Deepavali/Balipadyami
21 - Milad-Un-Nabi
23 - Guru Nanak's Birthday

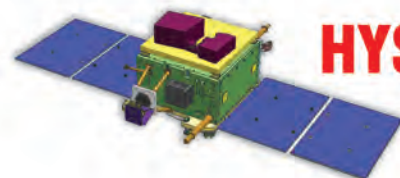
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S	M	T	F	S
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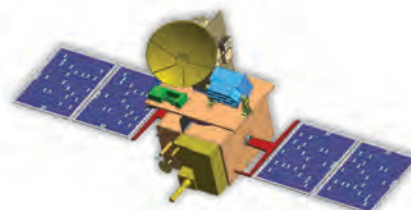
ristmas

ಉಪಗ್ರಹ Upagrah उपग्रह

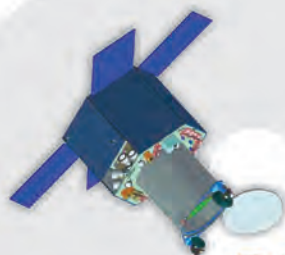
News Letter



HYSIS



OCEANSAT-3



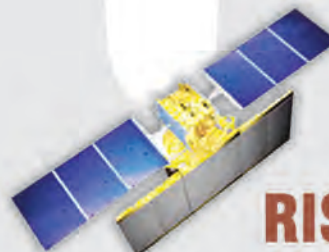
CARTOSAT-3



CARTOSAT-2F



RISAT-2A



RISAT-1A



EVENTS



NATIONAL LIBRARY WEEK

14th - 20th November

ISRO SATELLITE CENTRE, BENGALURU

**KARNATAKA RAJYOTSAVA
CELEBRATIONS**

NATIONAL LIBRARY WEEK

**BHARAT RATNA
DR. APJ ABDUL
KALAM MEMORIAL
LECTURE**

NASA DELEGATES VISIT TO ISIT

YOGA CLASSES AT ISAC

**SWACHH BHARAT ABHIYAN
PROGRAMME AT MALUR
SCHOOL, KOLAR**

IAS OFFICERS VISIT

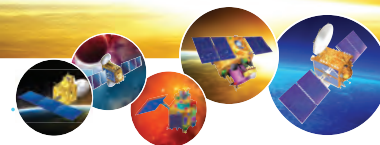
**सतर्कता जागरूकता सप्ताह - 2017 अनुपालन
OBSERVATION OF VIGILANCE AWARENESS WEEK - 2017
विषयवस्तु - "मेरा संदेश - कलकत्ता मुक्त भारत"
"MY VISION - CORRUPTION FREE INDIA"**

VIGILANCE AWARENESS WEEK

**ISAC CRECHE ANNUAL
DAY FUNCTION-2017**

**WORLD SPACE WEEK
CELEBRATION AT
MALUR SCHOOL-2017**

**ISAC CRECHE ANNUAL
DAY FUNCTION-2017**



FAILURE ANALYSIS LAB

Parts Evaluation and Failure analysis are the important activities of Components management system. The purpose of Parts evaluation is to determine conformance with applicable design, internal physical configuration and process requirements of a part while Failure analysis is a post mortem examination of failed devices. Both activities involve the process of disassembling, testing, and inspecting a device and employ many of the advanced analytical techniques of physics, metallurgy, and chemistry.

A well-established state-of-the-art facility for Parts Evaluation and Failure analysis, commonly known as FA lab, is an integral part of Component Quality Assurance Division, CMIG at ISAC.

A systematic methodology has been developed and implemented at this lab for Destructive Physical Analysis (DPA) and failure analysis. DPA forms part of Verification of Quality (VOQ) test. The Destructive Physical Analysis of EEE components carried out at this lab has proved to be a valuable technique in confirming the effectiveness of pre-cap visual inspection and quality procedure followed by the manufacturer for high reliability application. Failure analysis is carried out on the EEE components failed during various phases of hardware assembly and testing. Also Parts which exhibit previously defined anomalous behavior will be subjected to failure analysis. It involves determination of the root cause of failure and intimation of corrective action in test and /or application to eliminate the cause or prevent recurrence of the failure mode or mechanism reported. This lab provides a platform for failure simulation on good devices which in turn helps to verify the failure signature noticed in the device. Various failure modes noticed are fusing of bond wire, charring of metallization and punch through of metallization etc. The lab houses advanced and sophisticated analytical equipments such as Scanning Electron Microscope, Energy Dispersive Spectroscope, Real Time X-ray imaging system and Photon Emission Microscope. The services of this Lab are also extended for various analytical analysis such as Optical Microscopic Analysis, X-ray Analysis, SEM analysis and PEM analysis of various materials and processes. On an average 400-500 components are analytically analyzed per year.

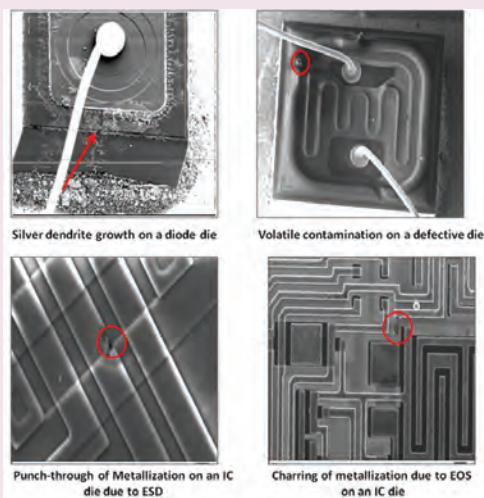
Let us have the glimpses of the important test/analytical facilities installed at this lab.

Scanning Electron Microscope & Energy Dispersive Spectroscope

The Scanning Electron Microscope (SEM) utilizes a focused, high energy electron beam that systematically scans across the specimen surface in the X- and Y- direction. The interaction of the electron beam with the specimen produces a large number of signals such as low energy secondary electrons at the specimen surface. The secondary electrons from the specimen are collected by PMT detector which converts them to electrical signal and eventually they are portrayed to a cathode ray tube (CRT), thus producing surface topography on CRT.

Scanning Electron Microscope has been used for internal visual examination as a part of DPA, FA, Die Evaluation, qualification of indigenization components. Information obtained from Scanning Electron Microscope while carrying out internal visual examination are surface topography, metallization quality, metallization at oxide steps, metallization coverage at contact windows, pins holes etc.

The Energy Dispersive Spectroscope (EDS), an appendage to Scanning Electron Microscope, is an instrument that utilizes the characteristic x-rays generated while primary electron beams hit the sample surface. Energy Dispersive Spectroscope has been used for characterization of the elements present on the surface of semiconductor dice/substrate, metallic/non-metallic parts. It also provides the evidence of ionic contamination, nature foreign particles hermetically sealed ICs, HMCs etc.



Images illustrating SEM analysis



Scanning Electron Microscope

Table 1: SEM and EDS Specifications

SEM Specifications	
Magnification	5X-5,00,000 X
Image Resolution	2nm with 20KV in SEI mode
Accelerating Voltage	0.2-20KV in steps of 100V
Specimen Stage	5-axis Eucentric Goniometer Stage
X-Y-Z movement	100mm-100mm-50mm
Tilt/Rotation	-1° to 90° / 360°
EDS Specifications	
Detector Resolution	129 eV for Mn K α
Samples Analysis	Elements including light elements Boron & above.

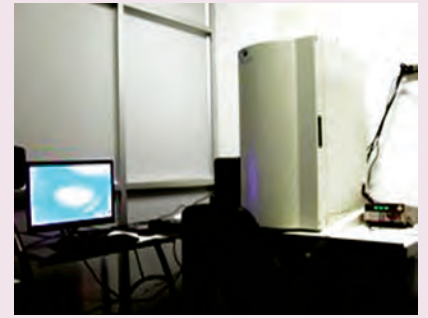


Photon Emission Microscope

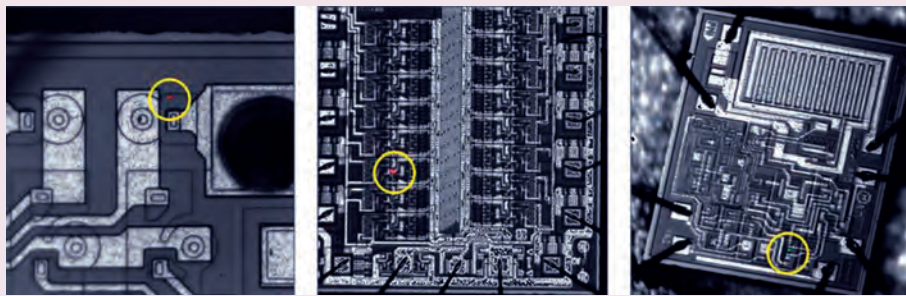
Photoemission microscope utilises a powerful image intensification technology to amplify the light emitted by defect sites within the semiconductor dice. The light is then collected by detectors based on the image intensifier or CCD arrays so that a radiation image is formed for a defect site. The resulting radiation image is then overlaid with its corresponding die surface image, such that the emission spot coincides with the precise location of the defect. IC analysis has typically been performed by collecting visible (390-770nm) and some near infrared band (770-1000nm) photons emitted from p-n junction of diode/transistor and other photon generating structure at/near electronically active silicon surface.

Some of the important utilities of PEM are:

- Detection of dielectric electro luminescence from gate dielectric breakdown and gate oxide short due to Electrostatic Discharge (ESD).
- Detection of previously unknown or undetectable electro luminescence.
- Detection of avalanche luminescence from junction break down and junction defects.
- Detection of electro luminescence from current flow through SiO_2 and Si_3N_4 .



Photon Emission Microscope



Hot spot at contact window near input pins of various IC's dice

Table 2: PEM Specifications

Minimum Feature for Objective:	0.8μm
Objective Magnification:	1X to 100X
Spectral Coverage:	355nm(UV) to 1100nm
Eye Piece:	Wide Field High Point, Infinity Corrected, 10X/24mm
Observation Tube:	Wide Field Trinocular Tube
Focussing Block:	Motorized Option-50 mm travel
Resolution:	1024 x1024 pixels
Pixel size (range):	13mmx13mm
Integration Time:	100ms to 1 hour
Spectral Range:	355nm to 1100nm

Real Time 3-D X-Ray Imaging System

The real 3-D X-ray imaging system has been recently inducted at Failure Analysis lab for investigation of internal construction details of EEE components during failure analysis and destructive physical analysis as well as during screening as per MIL-STD-750/883 methods 2076/2012. The unique 3-D imaging capability of this system provides high resolution, high magnification 3-D models of test specimens which can be analyzed in any plane without actually cutting the test specimen.

The real time x-ray imaging system is extensively useful for components such as capacitors, diodes, transistors, Ceramic ICs and HMCs etc. Specifically, the x-ray system is used to inspect Gold (Au) bond wire quality, attachment voids, lid seal, conductive foreign particles inside the hermetically sealed packages. This system can be used for 100% screening test for relays, where in physical movements of contacts can be seen under power "ON" condition. It also finds applications in X-ray inspection to ensure the registration of drilled holes to internal pads of multilayer printed circuit boards and to determine the quality of hidden solder bonds of surface-mounted components such as ball-grid arrays.

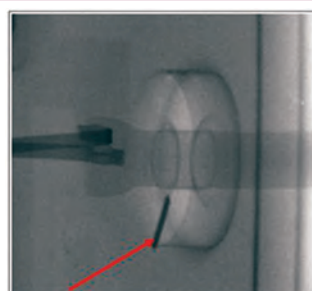
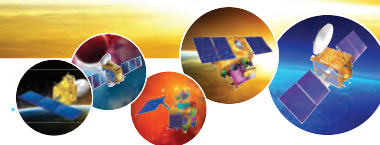


X-ray System

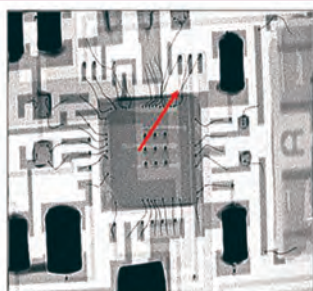
In order to upgrade technical capability, facility augmentation of Failure Analysis laboratory is under progress by including high end analytical equipments such as Scanning Acoustic Microscope (SAM) and De-processing Techniques of IC dice.

Significant Contribution of Failure Analysis Lab in Recent Past

In recent years failures of ceramic chip capacitors and chip resistors were observed due to body crack and passivation crack respectively. These failures pose high risk



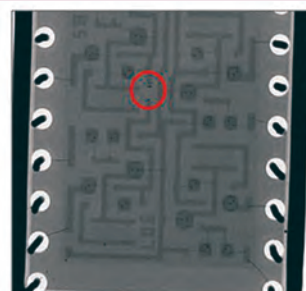
Conductive wire bond shorting pin and the body of a HMC



Sagging of wire bond within a HMC



Solder Ball formation within solid tantalum capacitor (CSR type)



Loose wire bond within the HMC and discontinuity of metallization

Images illustrating X-Ray Analysis

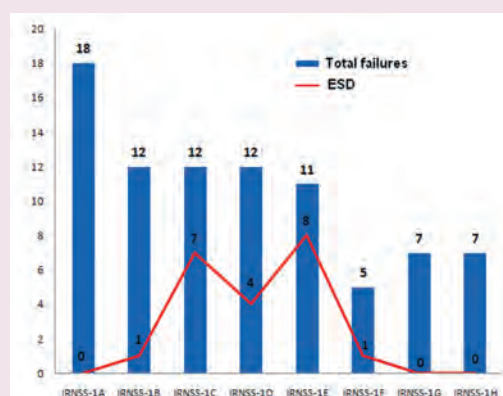
Table 3: 3-D X-Ray Imaging System specifications

Tube Voltage (Range)/ Power	Continuously variable Voltage: 30kV to 160 kV /10W
Target	Long Life Diamond Target
Geometric magnification	2500X
Total Magnification including Zoom	15600X
Feature recognition (Resolution)	0.5µm
Sample movement	5 Axis movement- X, Y, Z and 360o rotation & 70o inclination
Sample Loading	Front loading through transparent window
Sample support/maximum weight	Flat stage support for sample placement/5Kg
Maximum Inspection Area	508 mm x 444 mm

due their latent occurrence. Extensive failure simulation study on ceramic chip capacitors and chip resistors indicate that fabrication of these components using manual soldering process is the primary reason behind such failures. Based on FA feedback, reflow soldering technique has been adopted at ISAC and since then no such failures in ceramic chip capacitor and chip resistors were reported.

Photon Emission Microscope has contributed in finding subsurface defect within semi-conductor resulting due to ESD or soft ESD, which in turn help in concluding ESD and EOS related defects could be concludes. Such inputs help in reducing ESD related defects in the system. A comparative analysis of IRNSS series satellites as shown in the figure. Real time x-ray imaging system has been instrumental detecting the presence of solder ball formation within CSR-13 capacitors, loose particles within HMC packages, which has turn help in strengthening the process and non-recurrence of such failures.

Failure Analysis lab is equipped with all modern ESD preventive measures and fully compliance to ESD. Since April 2014 Failure Analysis lab is certified with ISO-9001-2008 and now ISO-9001-2015 certified.



Dr. Sarat Kumar Dash, Sandhya V Kamat, V Venkatesh
Components Management & Indigenisation Group

TRAINING & DEVELOPMENT PROGRAMMES CONDUCTED DURING OCTOBER- DECEMBER 2017

Sl.No	Training	Target Participants	Duration	No. of Participants
1.	Self Development Programme Through Lifestyle Enhancement	Drivers	06 th – 07 th October, 2017	20
2.	Certification Training Programme on "Basic Life Support System"	ISAC Employees	12 th October, 2017	27
3.	Self Development Programme Through Lifestyle Enhancement	Junior Engineers & Senior Technicians	30 th October – 02 nd November, 2017	25
4.	"Mandatory Training Programme (Electronics) at ISAC for Junior Engineers for the post of "Assistant Engineer"	Junior Engineers	01 st – 27 th November, 2017	16
5.	Enhancing Personal Effectiveness	Sci./Engr. –SD from ISAC, ISTRAC & MCF	23 rd – 25 th November, 2017	30
6.	ISRO Induction Training Programme(IITP-29)-Area Specific Intensive Module (ASIM): Satellite Area	Sci./Engr. SC from ISAC, LEOS, ISTRAC, MCF	27 th November – 15 th December, 2017	85
7.	Workshop on Basic of GST	ISAC Employees	30 th November, 2017	29
8.	Workshop on SAW Filters	Sci./Eng. From CSG, CMIG & SCG	21-23 December, 2017	15



ISRO Award 2016

Outstanding Achievement Award



Dr. NAGESWARA RAO M
Associate Director - ISAC

Performance Excellence Award



Shri SADANANDA RAO M A
Project Director, Cartosat-2 Series



Shri VISWANANTHA N
Former GD, SMG, ISAC

Merit Award – In recognition of meritorious contributions to the Indian Space Program



Shri ESWARA PRAKASH W V
Deputy Director



Shri PRAKASHARAO P J V K S
Program Director, GSAT-22, GSAT-23, GSAT-24



Shri NAGESH G
Program Director, Chandrayaan-2



Shri M VISWANATHAN
Sci./Eng.-G, LEOS

Young Scientist Award



Shri CH RAMA KISHORE
SCI./ENG.-SE



Shri JAFI E J
SCI./ENG.-SE



Shri KISHORE BABU N
SCI./ENG.-SE



Shri SAKTHIVEL M
SCI./ENG.-SE



Shri NARESH P
SCI./ENG.-SE



Ms RAJITHA
SCI./ENG.-SE



Shri SRIKANTH S V S S
SCI./ENG.-SE



Shri SAURABH GUPTA
SCI./ENG.-SE



Ms SOWBHAGYA
SCI./ENG.-SE

SERVICE EXCELLENCE AWARD 2016



Shri SUDHINDRA DESAI
SCI./ENG.-G, Group Director, CMG



Shri VIRUPAKSHAPPA B
SCI./ENG.-SG, Deputy Group Head - C&MG



Shri NAGARAJA S R
Catering Manager



Shri KRISHNA MURTHY H N
Catering Attendant-A



Shri VANDAKUMAR B
Purs. & Stores Officer



Shri NATARAJAN P
Admin. Officer



Shri SURESH BABU A
SR. Accounts Officer



Shri GNANA MOORTHY R
Junior Engineer



Shri RAJASHEKAR R
Project L V Driver

PhD Award



Dr. Pradeep K. Peter of Power Systems, ISAC, completed Ph.D from the Dept. of Electrical Engineering, Indian Institute of Technology Bombay, Mumbai, in Sept. 2017.

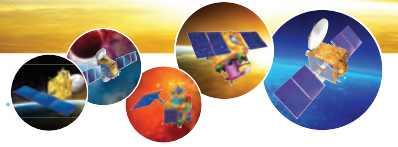
Thesis: **"Photovoltaic Source Fed Switched Capacitor Power Conditioners"**.

The Ph.D research has resulted in the publication of three IEEE Journal papers and six IEEE conference papers and the grant of two U.S. Patents.

ACHIEVEMENT



Ms. Sashikala, CISF, won first place in Javelin Throw, Discus Throw, 1500 mts running, 5 km walking, organized at 38th Karnataka State Masters Athletic Championship 2017-2018 on December 23-24, 2017 at Hosakote.



ಕರ್ನಾಟಕ ರಾಜ್ಯೋತ್ಸವ - ೨೦೧೭, ಹೊಸತುಗಳ ಚಿಲುಮೆ

ಇಸ್ರೋ ಉಪಗ್ರಹ ಕೇಂದ್ರದಲ್ಲಿ ನಡೆಯುವ ಕರ್ನಾಟಕ ರಾಜ್ಯೋತ್ಸವವೆಂದರೆ ಸಂಭ್ರಮ, ಆನಂದ, ಉತ್ಸಾಹ, ಸಡಗರಗಳ ಆಗರ. ಕೇಂದ್ರದ ಕೆಲಸಗಳ ಒತ್ತಡದ ನಡುವೆಯೂ ಎಲ್ಲರೂ ಜೊತೆಗೂಡಿ ಆಯೋಜಿಸುವ ಈ ಕಾರ್ಯಕ್ರಮ ಸುವ್ಯವಸ್ಥೆ ಮತ್ತು ಅಚ್ಚುಕಟ್ಟುತನದ ಉದಾಹರಣೆ. ಅದರೊಟ್ಟಿಗೆ ಈ ವರ್ಷದ ರಾಜ್ಯೋತ್ಸವ ಹಲವು ಹೊಸತನಗಳನ್ನು ಹೊತ್ತಿತ್ತು.

ನವೆಂಬರ್ ೨೨ರಂದು ಆಯೋಜಿತವಾಗಿದ್ದ ರಾಜ್ಯೋತ್ಸವವು, ಪರಂಪರೆಯಂತೆ, ಇಸ್ರೋ ಅಧ್ಯಕ್ಷರೂ, ಅಂತರಿಕ್ಷ ವಿಭಾಗದ ಕಾರ್ಯದರ್ಶಿಗಳೂ ಆದ ಶ್ರೀ ಎ ಎಸ್ ಕಿರಣ್ ಕುಮಾರರ ಅಧ್ಯಕ್ಷತೆಯಲ್ಲಿ ನಡೆಯಿತು. ಜನಪ್ರಿಯ ವಿಜ್ಞಾನ ಬರಹಗಾರರಾದ ಡಾ. ಟಿ ಆರ್ ಅನಂತರಾಮರವರು ಮುಖ್ಯ ಅತಿಥಿಗಳಾಗಿ ಆಗಮಿಸಿದ್ದರು. ಅವರಿಬ್ಬರ ಉಪಸ್ಥಿತಿಗೆ ಭೂಷಣವೆಂಬಂತೆ ಕೇಂದ್ರವು ಎರಡು ವಿಜ್ಞಾನ ಕೃತಿಗಳನ್ನು ಕೊಡುಗೆಯಾಗಿ ನೀಡಿತು. ಕೇಂದ್ರದ ನಿರ್ದೇಶಕರಾದ ಡಾ. ಎಮ್ ಅಣ್ಣಾದುರೈರವರು ತಮಿಳಿನಲ್ಲಿ ಮಂಗಳಯಾನದ ಬಗ್ಗೆ ಬರೆದಿರುವ ಪುಸ್ತಕದ ಕನ್ನಡ ಅನುವಾದ ಕೃತಿ "ರೆಕ್ಕೆ ಬಿಚ್ಚಿದ ಮಂಗಳಯಾನ - ಕೈಗೆಟುಕಿದ ಮಂಗಳ" ಅಂದು ಬಿಡುಗಡೆಗೊಂಡಿತು. ಮಂಗಳಯಾನದ ತಂತ್ರಜ್ಞಾನ ಮತ್ತು ಕಾರ್ಯಾಯೋಜನೆಯ ಬಗ್ಗೆ ಜನಸಾಮಾನ್ಯರಿಗೂ ಅರ್ಥವಾಗುವಂತಹ ಸರಳ ಭಾಷೆ ಮತ್ತು ಪ್ರಭಾವಿ ನಿರೂಪಣೆ ಈ ಪುಸ್ತಕದ ವಿಶೇಷ. ನಮ್ಮ ಕೇಂದ್ರದ ಸಹೋದ್ಯೋಗಿಗಳಾದ ಡಾ. ಬಿ ಆರ್ ನಾಗೇಂದ್ರ, ಶ್ರೀ ಎಮ್ ಮಾದೇಶ್ವರನ್, ಶ್ರೀ ಎನ್ ಮಣಿಕಂಠನ್ ಮತ್ತು ಶ್ರೀ ಎಸ್ ಎ ಕಣ್ಣನ್‌ರವರುಗಳು ಸೊಗಸಾಗಿ ಅನುವಾದ ಮಾಡಿದ್ದಾರೆ. ಬಿಡುಗಡೆಯ ಸಂದರ್ಭದಲ್ಲಿ ಪುಸ್ತಕದ ಸ್ಥೂಲ ಪರಿಚಯವನ್ನು ಶ್ರೀ ಪಿ ಜಯಸಿಂಹ ಮಾಡಿಕೊಟ್ಟರು. ತಮಿಳುನಾಡಿನ ಓದುಗರ ಮನಸೂರೆಗೊಂಡಿರುವ ಈ ಪುಸ್ತಕ ಕನ್ನಡಿಗರ ಕೈಗೆಟುಕಿದ್ದು ಸಂತಸದ ಸಂಗತಿ.



ಉಪಗ್ರಹ ತಂತ್ರಜ್ಞಾನದ ಬಗ್ಗೆ ಒಂದು ಸಮಗ್ರ ಕೈಪಿಡಿ ಪುಸ್ತಕ ತಯಾರಿಸುವಲ್ಲಿ ಕೇಂದ್ರದ ಸಹೋದ್ಯೋಗಿಗಳ ಪ್ರಯತ್ನ ಮತ್ತೊಂದು ಮಹತ್ವಪೂರ್ಣ ಕಾರ್ಯ. ಪ್ರತಿವರ್ಷದಂತೆ ಈ ವರ್ಷದ ಕನ್ನಡ ತಾಂತ್ರಿಕ ಕಮಿಟಿ ಕೈಯೊಂಡ ವಿಷಯ "ಉಪಗ್ರಹ ತಂತ್ರಜ್ಞಾನಕ್ಕೊಂದು ಬೆಳಕಿಂಡಿ". ಉಪಗ್ರಹ ವಿನ್ಯಾಸ, ತಯಾರಿಕೆ ಮತ್ತು ಪರೀಕ್ಷಣೆಗಳಲ್ಲಿ ಪಾಲ್ಗೊಳ್ಳುವ ಎಲ್ಲ ಉಪವ್ಯವಸ್ಥೆಗಳ ಸಂಕ್ಷಿಪ್ತ ಹಾಗೂ ಸಮಗ್ರ ಮಾಹಿತಿಯನ್ನು ನೀಡುವ ನಿಟ್ಟಿನಲ್ಲಿ ಪ್ರಯತ್ನನಡೆಸಿ, ಪ್ರಾಥಮಿಕ ಹಂತದ ಕೃತಿಯನ್ನು ಸಿದ್ಧಪಡಿಸಲಾಗಿದೆ. ಇದರ ಪರಿಷ್ಕೃತ ಕೃತಿಯು ಕನ್ನಡ ವಿಜ್ಞಾನ ಶಿಕ್ಷಕರಿಗೆ ಮತ್ತು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಉಪಯುಕ್ತ ಮಾಹಿತಿ ನೀಡಿ, ಈ ಕ್ಷೇತ್ರದಲ್ಲಿ ಅವರು ಆಸಕ್ತಿಯಿಂದ ಅಧ್ಯಯನದಲ್ಲಿ ತೊಡಗಿಕೊಳ್ಳುವಂತೆ ಆಗಬೇಕೆಂಬುದು ಯೋಜನೆಯ ಆಶಯ.

ರಾಷ್ಟ್ರಕವಿ ಕುವೆಂಪು ವಿರಚಿತ ಕೃತಿಯನ್ನು ಶ್ರೀ ಎಂ ಸತ್ಯನಾರಾಯಣ ಮತ್ತು ಸಂಗಡಿಗರು ಸುಶ್ರಾವ್ಯವಾಗಿ ಹಾಡುವುದರ ಮೂಲಕ ಕಾರ್ಯಕ್ರಮಕ್ಕೆ ಚಾಲನೆ ನೀಡಿದರು. ಉತ್ಸವ ಸಮಿತಿಯ ಅಧ್ಯಕ್ಷರಾದ ಶ್ರೀ ಜಿ ಎನ್ ವಿ ಪ್ರಸಾದರು ಎಲ್ಲಾ ಗಣ್ಯರಿಗೂ ಸ್ವಾಗತ ಕೋರಿದರು. ಸ್ವಾಗತಿಸಲು ಪಾರಂಪರಿಕ ಹೂಗುಚ್ಚಗಳಿಗೆ ನೀಡುವ ಪರ್ಯಾಯವಾಗಿ ಸಸಿಗಳನ್ನು ನೀಡಿದ್ದು ಹಲವರ ಮೆಚ್ಚುಗೆ ಗಳಿಸಿತು. ಕಾರ್ಯಕ್ರಮ ಉದ್ಘಾಟಿಸಿ ಮಾತನಾಡಿದ ಡಾ. ಎಂ ಅಣ್ಣಾದುರೈರವರು ಉಪಗ್ರಹ ಯೋಜನೆಗಳ ಪ್ರಗತಿಯನ್ನು ಶ್ಲಾಘಿಸುತ್ತಾ ತಂತ್ರಜ್ಞಾನ ಮತ್ತು ಭಾಷೆಯ ಅಭಿವೃದ್ಧಿಯ ಬಗ್ಗೆ ಪ್ರಸ್ತಾಪಿಸಿದರು. ಮುಖ್ಯ ಅತಿಥಿ ಡಾ. ಟಿ ಆರ್ ಅನಂತರಾಮ ರಾಜ್ಯೋತ್ಸವ ಆಚರಣೆಯ ಹಿನ್ನೆಲೆ, ಪ್ರಮುಖ್ಯತೆ ಮತ್ತು ತಾಂತ್ರಿಕ ವಿಷಯಗಳನ್ನು ಕನ್ನಡದಲ್ಲಿ ಜನಸಾಮಾನ್ಯರಿಗೆ ತಲುಪಿಸುವ ಅವಶ್ಯಕತೆಯ ಬಗ್ಗೆ ಪ್ರೇಕ್ಷಕರಿಗೆ ಮನದಟ್ಟು ಮಾಡಿಸಿದರು.



ಮಾಡಿಸುತ್ತಾರೆ. ಈ ವರ್ಷದ ದಿಗ್ಗಜರ ಸ್ಮರಣೆಯಲ್ಲಿ ಖ್ಯಾತ ಸಾಹಿತಿ ಶ್ರೀಮತಿ ಎಂ ಕೆ ಇಂದಿರಾರವರ ಸಾಧನಾಮಾರ್ಗವನ್ನು ಶ್ರೀಮತಿ ಸೌಭಾಗ್ಯ ಪ್ರಭಾವಿಯಾಗಿ ಪರಿಚಯಿಸಿದರು. ಶ್ರೀ ಎಸ್ ವಿ ಬಿಂದಗಿ ಮತ್ತು ಶ್ರೀ ಎಸ್ ಎಂ ಕಟ್ಟಿಮನಿಯವರು ಗದಗ ಜಿಲ್ಲೆಯ ಭೌಗೋಳಿಕ, ಐತಿಹಾಸಿಕ ಮತ್ತು ಸಾಂಸ್ಕೃತಿಕ ಶ್ರೀಮಂತಿಕೆಯ ಪರಿಚಯ ಮಾಡಿಕೊಟ್ಟರು.

ಸಮಿತಿಯ ಉಪಾಧ್ಯಕ್ಷರಾದ ಶ್ರೀ ಸುಬ್ರಹ್ಮಣ್ಯ ಉಡುಪರು ಉತ್ಸವದ ಯಶಸ್ಸಿಗೆ ಕಾರಣರಾದ ಎಲ್ಲರನ್ನೂ ವಂದಿಸಿದರು. ಶ್ರೀ ಎಚ್ ಎನ್ ಸುರೇಶ ಕುಮಾರರು ಇಡೀ ಕಾರ್ಯಕ್ರಮವನ್ನು ನವಿರಾಗಿ, ಸೊಗಸಾಗಿ ನಿರೂಪಿಸಿದರು. ಭೋಜನಾನಂತರ ಕೇಂದ್ರದ ಸಹೋದ್ಯೋಗಿಗಳು ಮತ್ತು ಅವರ ಕುಟುಂಬ ಸದಸ್ಯರು ಚಿತ್ತಾಕರ್ಷಕ ಸಾಂಸ್ಕೃತಿಕ ಕಾರ್ಯಕ್ರಮವನ್ನು ಪ್ರಸ್ತುತಪಡಿಸಿದರು. ಗಾಯನ, ನೃತ್ಯ ನಾಟಕಗಳಂತಹ ವರ್ಣಮಯ ಕಾರ್ಯಕ್ರಮಗಳು ಹೊಸ ವರ್ಣರಂಜಿತ ಲೋಕವನ್ನೇ ಸೃಷ್ಟಿಸಿದ್ದವು.

ಪಿ. ಜಯಸಿಂಹ, ಕಾರ್ಯದರ್ಶಿ, ಕರ್ನಾಟಕ ರಾಜ್ಯೋತ್ಸವ ಸಮಿತಿ-೨೦೧೭



ಬಾಹ್ಯಾಕಾಶ ಕ್ಷೇತ್ರದ ಬಗ್ಗೆ ಚಿಣ್ಣು ಮಾಡಿದ ಸಂಶೋಧನಾ ಅಧ್ಯಯನ

ಇಸ್ರೊ ಉಪಗ್ರಹ ಕೇಂದ್ರದಲ್ಲಿ ಪ್ರತಿವರ್ಷ ಕರ್ನಾಟಕ ರಾಜ್ಯೋತ್ಸವದ ನಿಮಿತ್ತ ಕನ್ನಡ ತಾಂತ್ರಿಕ ಕಮಿಟಿ ನಡೆಯುತ್ತದೆ. ಸಂಸ್ಥೆಯ ವಿಜ್ಞಾನಿಗಳು ವಿವಿಧ ಸಂಶೋಧನೆಗಳ ಬಗ್ಗೆ ಅಧ್ಯಯನಯೋಗ್ಯ ಲೇಖನಗಳನ್ನು ಬರೆಯುತ್ತಾರೆ. ಕಳೆದ ವರ್ಷ ಈ ನಿಟ್ಟಿನಲ್ಲಿ ಸಂಸ್ಥೆಯ ಅಧ್ಯಕ್ಷರಾದ ಶ್ರೀ ಎ ಎಸ್ ಕಿರಣ್ ಕುಮಾರ್‌ರವರು ಹೊಸತೊಂದು ಯೋಜನೆಯ ಸಲಹೆಯನ್ನು ನೀಡಿದರು. ಅದೇನೆಂದರೆ ಕನ್ನಡ ಮಾಧ್ಯಮದಲ್ಲಿ ಓದುತ್ತಿರುವ ಶಾಲೆಯ ಮಕ್ಕಳು ಬಾಹ್ಯಾಕಾಶ ಕ್ಷೇತ್ರಕ್ಕೆ ಸಂಬಂಧಿಸಿದ ಸಂಶೋಧನೆಗಳನ್ನು ನಡೆಸಲು ಪ್ರೇರಣೆ ನೀಡುವುದು, ಹಾಗೂ ಅವರಿಂದ ತಾಂತ್ರಿಕ ಮಾಡಿದ ಸಂಶೋಧನಾ ಲೇಖನಗಳ ಸ್ಪರ್ಧೆಯನ್ನು ಏರ್ಪಡಿಸುವುದು. ಈ ಮೂಲಕ ಬೆಳೆಯುವ ಮೊಳಕೆಗಳಲ್ಲಿ ವೈಜ್ಞಾನಿಕ ಚಿಂತನೆಯನ್ನು ಹಾಗೂ ವ್ಯವಸ್ಥಿತ ಅಧ್ಯಯನಶೀಲತೆಯನ್ನು ಬೆಳೆಸಲು ಅನುಕೂಲವಾಗುತ್ತದೆ.



ಈ ವರ್ಷದ ರಾಜ್ಯೋತ್ಸವದಲ್ಲಿ ಇದರ ಆರಂಭಿಕ ಪ್ರಯೋಗವನ್ನು ಮಾಡಲಾಯಿತು. ಉಪಗ್ರಹ ಮತ್ತು ರಾಕೆಟ್ ತಂತ್ರಜ್ಞಾನಕ್ಕೆ ಸಂಬಂಧಪಟ್ಟ ೧೪ ವಿವಿಧ ವಿಷಯಗಳ ಬಗ್ಗೆ ಪ್ರೌಢಶಾಲೆಯ ಮಕ್ಕಳು ಲೇಖನಗಳನ್ನು ಬರೆದು ಮಂಡಿಸಲು ಅವಕಾಶ ನೀಡಲಾಗಿತ್ತು. ಲಕ್ಷ್ಮೀಶ್ವರದ ಚಂದನ ಶಾಲೆ, ಸರಗೂರಿನ ವಿವೇಕಾನಂದ ಸ್ಕೂಲ್ ಆಫ್ ಎಕ್ಸಲೆನ್ಸ್ ಮತ್ತು ಚಾಮರಾಜನಗರದ ದೀನಬಂಧು ಶಾಲೆಯಿಂದ ೧೮ ವಿದ್ಯಾರ್ಥಿಗಳು ಉತ್ಸಾಹದಿಂದ ಭಾಗವಹಿಸಿದ್ದರು. ನವೆಂಬರ್ ೨೧ರಂದು ಇಸ್ರೊ ಉಪಗ್ರಹ ಕೇಂದ್ರದಲ್ಲಿ ತಮ್ಮ ಲೇಖನಗಳನ್ನು ಮಂಡಿಸಿದರು. ಕೇಂದ್ರದ ನಿವೃತ್ತ ಹಿರಿಯ ವಿಜ್ಞಾನಿಗಳಾದ ಡಾ ಎಂ ರವೀಂದ್ರ, ಡಾ ಎಚ್ ಆರ್ ನಾಗೇಂದ್ರ, ಶ್ರೀ ಆರ್ ರಮೇಶ್‌ರವರ ಜೊತೆಗೆ ಕೇಂದ್ರದ ಸಹೋದ್ಯೋಗಿ ವಿಜ್ಞಾನಿಗಳಾದ ಶ್ರೀ ವಿ ಚಂದ್ರಬಾಬುರವರು ನಿರ್ಣಾಯಕರಾಗಿ ಕಾರ್ಯ ನಿರ್ವಹಿಸಿದರು. ಬಹುಮಾನ ವಿಜೇತರಿಗೆ ಮರುದಿನ ನಡೆದ ರಾಜ್ಯೋತ್ಸವ ಸಮಾರಂಭದಲ್ಲಿ ಇಸ್ರೊ ಅಧ್ಯಕ್ಷರಾದ ಶ್ರೀ ಎ ಎಸ್ ಕಿರಣ್ ಕುಮಾರ್ ರವರು ಬಹುಮಾನಗಳನ್ನು ವಿತರಿಸಿದರು. ಇದರ ಜೊತೆಗೆ ಆ ಪ್ರಶಸ್ತಿ ವಿಜೇತ ಮಕ್ಕಳಿಗೆ ಶ್ರೀಹರಿಕೋಟಾದಿಂದ ರಾಕೆಟ್ ಉಡಾವಣೆಯನ್ನು ವೀಕ್ಷಿಸುವ ಅವಕಾಶವನ್ನು ಕಲ್ಪಿಸಿಕೊಡಲು ಯೋಜಿಸಲಾಗಿದೆ.

ನಿರ್ವಹಣೆ ಮತ್ತು ಮಾಹಿತಿ ವ್ಯವಸ್ಥೆ ಕ್ಷೇತ್ರದ ಉಪನಿರ್ದೇಶಕರಾದ ಶ್ರೀ ಜಿ ಎನ್ ವಿ ಪ್ರಸಾದ್, ಮಾನವ ಸಂಪನ್ಮೂಲ ವಿಭಾಗದ ಶ್ರೀ ಕೆ ಎಸ್ ಪ್ರಕಾಶ್ ಮತ್ತು ಅವರ ಸಹೋದ್ಯೋಗಿಗಳು, ನಿವೃತ್ತ ಸಹೋದ್ಯೋಗಿ ಶ್ರೀ ಆರ್ ರಮೇಶ್‌ರವರ ಸಹಯೋಗದೊಂದಿಗೆ ಸೊಗಸಾಗಿ ಇಡೀ ಕಾರ್ಯಕ್ರಮ ನಿರ್ವಹಿಸಿದರು. ಮುಂದಿನ ದಿನಗಳಲ್ಲಿ ಇದನ್ನು ಮತ್ತಷ್ಟು ವಿಸ್ತಾರವಾಗಿ ಯೋಜಿಸಲು ಅಡಿಗಲ್ಲಿಟ್ಟಂತಾಯಿತು.

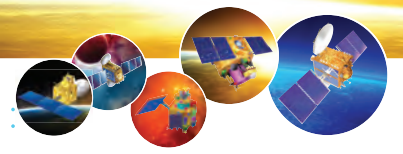
आईजेक में राजभाषा कार्यान्वयन - नगर राजभाषा कार्यान्वयन समिति की बैठक

नगर राजभाषा कार्यान्वयन समिति के वर्ष 2017 की दूसरी बैठक इसरो उपग्रह केंद्र-आईजेक, बेंगलूरु के सतीश धवन सभागृह में दिनांक 19 दिसंबर 2017 को अपराह्न 2.30 बजे आयोजित की गई। डॉ. एम. अण्णादुरै, अध्यक्ष, नराकास (का-1) एवं निदेशक, इसरो उपग्रह केंद्र-आईजेक ने बैठक की अध्यक्षता की। राजभाषा विभाग से श्री टेकचंद, उप निदेशक (कार्या), क्षेत्रीय कार्यान्वयन कार्यालय, श्री ईश्वरचन्द्र मिश्र, सहायक निदेशक, केंद्रीय अनुवाद ब्यूरो एवं श्री राजेंद्र कुमार शर्मा, सहायक निदेशक, हिंदी शिक्षण योजना भी बैठक में उपस्थित रहे।



श्रीमती नलिनी प्रकाश एम.एस., हिंदी अनुवादक ने ईश वंदना प्रस्तुत की। तदनंतर श्री मनोहर एल. वाणियर, वरिष्ठ प्रधान, कार्मिक व सामान्य प्रशासन, आईजेक ने मंचासीन अधिकारियों के साथ-साथ सभागार में उपस्थित कार्यालय प्रधानों एवं प्रतिभागियों का स्वागत किया और साथ ही उन्होंने अपने स्वागत भाषण में, संसदीय राजभाषा समिति की आलेख एवं उप साक्ष्य समिति द्वारा दिए गए सुझावों पर प्रकाश डाला तथा नराकास के सभी सदस्य कार्यालयों के प्रधानों की बैठक में उपस्थिति की अनिवार्यता के बारे में भी बताया।

बैठक में सदस्य कार्यालयों के 97 कार्यालय प्रधान, प्रशासनिक प्रधान, राजभाषा अधिकारी एवं अन्य सदस्य उपस्थित रहे।



श्री ईश्वरचन्द्र मिश्र, सहायक निदेशक, केन्द्रीय अनुवाद ब्यूरो ने इसरो में राजभाषा कार्यान्वयन की दिशा में प्रगामी प्रयासों की सराहना की। तदनंतर उन्होंने ब्यूरो की तरफ से आयोजित किए जाने वाले विभिन्न अनुवाद प्रशिक्षण कार्यक्रमों का विवरण देते हुए बताया कि सभी कार्यालय अपने यहां कार्यरत अनुवादक एवं राजभाषा के कार्य से जुड़े पदाधिकारियों को केंद्रीय अनुवाद ब्यूरो के प्रशिक्षण में नामित करें।

श्री राजेंद्र कुमार शर्मा, सहायक निदेशक, हिन्दी शिक्षण योजना ने केन्द्रीय सदन, कोरमंगला में चल रही नियमित हिन्दी कक्षाओं की जानकारी दी। उन्होंने कार्यालय प्रधानों से विभिन्न हिन्दी प्रशिक्षण कक्षाओं में कर्मचारियों को नामित करने का अनुरोध किया।

श्रीमती गीता प्रसाद, सदस्य सचिव एवं हिन्दी अधिकारी, आईजेक ने मंचासीन गणमान्यों एवं सभा में उपस्थित सभी पदाधिकारियों का अभिनंदन किया। तत्पश्चात् उन्होंने अध्यक्ष नराकास (का-1) की अनुमति से बैठक की कार्यवाही शुरू की। इसके उपरान्त कार्यसूची पर चर्चा आरंभ हुई। तदनंतर, सदस्य सचिव ने नराकास (का-1) की गतिविधियों के बारे में संक्षिप्त रिपोर्ट प्रस्तुत किया।

श्री टेकचंद, उप-निदेशक(कार्या), क्षेत्रीय कार्यान्वयन कार्यालय ने राजभाषा कार्यान्वयन से संबंधित तिमाही ऑकड़ो पर गौर किया और विभिन्न मदों जैसे धारा 3(3), नियम 5, पत्राचार, कोड और मैनुअल आदि पर विस्तार से चर्चा की। साथ ही उन्होंने सभी सदस्य कार्यालयों से आग्रह किया कि नराकास (का-1) के तत्वावधान में हिन्दी कार्यान्वयन के उत्तरोत्तर प्रगति हेतु सभी का सहयोग वांछनीय है।

डॉ. ए.के. शर्मा, नियंत्रक, आईजेक ने सभा में उपस्थित सभी पदाधिकारियों से अपील किया कि हिन्दी के प्रचार-प्रसार को केवल लक्ष्य प्राप्त करने तक ही सीमित न रखते हुए उसे दैनिक काम-काज एवं बोलचाल में सहज रूप से उसका प्रयोग करें, जिससे स्वतः हिन्दी का प्रचार-प्रसार होगा। इससे लोगों में हिन्दी के प्रति जागरूकता बढ़ेगी और लोगों में हिन्दी के प्रति झिझक दूर होगी।

डॉ. एम. अण्णादुरै, अध्यक्ष, नराकास ने वर्ष 2018 के नगर राजभाषा कार्यान्वयन समिति (का-1) के कैलेंडर का विमोचन किया तथा उन्होंने सभा को संबोधित करते हुए कहा कि नराकास (का-1) के तत्वावधान में एक विशेष वेबसाइट बनाया गया है। साथ ही दैनिक कामकाज में प्रयोग किए जाने वाले संक्षिप्त नेमी टिप्पणियों की एक पुस्तिका भी तैयार की गई है, इसे सभी सदस्य कार्यालयों को दिया जा रहा है। अतः इस संबंध में उन्होंने सभी कार्यालयों प्रधानों से अनुरोध किया कि हिन्दी के प्रचार प्रसार को बढ़ावा देने हेतु, अपने कार्यालय के दैनिक कामकाज में हिन्दी का अधिकाधिक प्रयोग करें एवं नराकास (का-1) के तत्वावधान में नए नए कार्यक्रमों का आयोजन करें और नराकास की प्रत्येक बैठक में कार्यालय प्रधान अवश्य भाग लें।

श्रीमती सीना राजेन्द्रन, वरिष्ठ हिन्दी अधिकारी ने मंचासीन गणमान्यों एवं सभा में उपस्थित सभी पदाधिकारियों का आभार प्रकट किया। कुमारी अकांक्षा, सहायक, आईजेक ने पूरे कार्यक्रम का मंच संचालन किया।

हिंदी कार्यशाला रिपोर्ट

भारत सरकार, राजभाषा विभाग तथा संसदीय राजभाषा समिति के निदेशों के अनुसार, हिन्दी के प्रगामी प्रयोग को बढ़ावा देने हेतु केन्द्र द्वारा हर तिमाही में अधिकारी/कर्मचारियों के लिए हिन्दी कार्यशाला का आयोजन किया जाता है। इस संबंध में, इसरो उपग्रह केंद्र द्वारा दिनांक 07.11.2017 को सहायक अभियंता एवं कनिष्ठ अभियंताओं के लिए हिन्दी अनुभाग द्वारा एक हिन्दी कार्यशाला का आयोजन किया गया था। सर्वप्रथम, श्री. शारिख, वरिष्ठ सहायक ने वरिष्ठ हिन्दी अधिकारी एवं प्रतिभागियों का स्वागत किया। श्री. दीपक कुमार उजगरे, वरिष्ठ हिन्दी अधिकारी, आईजेक ने सत्र का संचालन किया। कार्यशाला के दौरान उन्होंने राजभाषा के महत्व को बताते हुए राजभाषा की नीति, नियमों एवं अधिनियमों



पर प्रकाश डाला और केंद्र में लागू विभिन्न प्रोत्साहन योजनाओं एवं प्रशिक्षण के बारे में सभी प्रतिभागियों को अवगत कराया। साथ ही उन्होंने "दैनंदिन कार्य में हिन्दी का प्रयोग" विषय पर व्यावहारिक रूप से प्रशिक्षणार्थियों को विस्तृत ज्ञानवर्धक जानकारी भी प्रदान की।

इस कार्यशाला में कुल 50 प्रतिभागियों ने भाग लिया। श्रीमती. ईश्वरी सुगुमार, वरिष्ठ प्रशासन अधिकारी, आईजेक ने कार्यशाला के समापन समारोह की अध्यक्षता की। उन्होंने सभी प्रतिभागियों को अपने कर-कमलों से प्रमाण पत्र वितरित किया।

कार्यशाला के अंत में श्री. शारिख, वरिष्ठ सहायक ने सभी का आभार प्रकट किया।

हिंदी पखवाडा एवं हिंदी दिवस समारोह

संघ सरकार की नीति के अनुसार हर वर्ष 14 सितंबर को हिंदी दिवस मनाया जाता है। इस उपलक्ष्य में इसरो उपग्रह केंद्र, बेंगलूरु द्वारा दिनांक 13.09.2017 से 26.09.2017 तक केंद्र में हिंदी पखवाडा का आयोजन किया गया। इस दौरान कुल 17 प्रतियोगिताओं का आयोजन किया गया। इसमें हिंदी समूह व गैर हिंदी भाषियों के लिए अलग से हिंदी टिप्पण एवं आलेखन, समाचार वाचन, पाठन प्रतियोगिता, सुलेखन प्रतियोगिता, कविता लेखन, गायन, जीभ अमेदुआ, तस्वीर क्या बोलती है, अंताक्षरी, विविधा, श्रुतलेखन आदि प्रतियोगिता का आयोजन किया गया। प्रतियोगिता में अधिक संख्या में प्रतिभागियों की प्रतिभागिता को सुनिश्चित करने के लिए प्रोत्साहन के रूप में सभी प्रतिभागियों को की-चैन दिया गया तथा हिंदी दिवस के सुअवसर पर हिंदी प्रचार व प्रसार हेतु इसरो लोगो तथा हिंदी नारा मुद्रित टी-शर्ट को इच्छुक अधिकारी व कर्मचारियों को दिया गया।

डॉ. राजकुमार उपाध्याय, आई.टी.एस., अपर महा निदेशक (दक्षिण क्षेत्र) प्रसार भारती बेंगलूरु मुख्य अतिथि रहे। श्री. नागेश्वर राव, सह निदेशक, आईजेक ने समारोह की अध्यक्षता की तथा अध्यक्षीय भाषण दिया। श्रीमती गीता प्रसाद, हिंदी अधिकारी ने वार्षिक रिपोर्ट प्रस्तुत की। प्रतियोगिता के सभी विजेताओं को मुख्य अतिथि ने प्रमाण पत्र वितरित किया।

केंद्र में नियंत्रक महोदय के सुझाव के अनुसार प्रत्येक वर्ग के पदाधिकारियों के लिए मासिक प्रतियोगिता का आयोजन किया जाता है। इन प्रतियोगिताओं के विजेताओं को भी हिंदी दिवस समारोह पर प्रमाण पत्र वितरित किए गए। अंतरिक्ष विभाग के आदेशानुसार, हिंदी में अधिक कार्य करने वाले अनुभाग/प्रभागों का निरीक्षण किया गया तथा निम्न 03 अनुभाग/प्रभाग को शील्ड एवं प्रमाण पत्र वितरित किया गया।

✦ स्थापना । स्थापना ॥ ✦ जियोसेट ✦ पी.पी.ई.जी.

आईजेक में हिंदी दिवस समारोह में सांस्कृतिक संध्या के दौरान आईजेक के कर्मचारियों द्वारा सांस्कृतिक कार्यक्रम प्रस्तुत किया गया तथा उसी दिन नराकास (का-1) के तत्वावधान में पद्मश्री पुरस्कार से सम्मानित डॉ. सुरेन्द्र शर्मा एवं उनकी टीम द्वारा हास्य कवि सम्मेलन का आयोजन किया गया।

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